

THE SENEGAL CASE STUDY

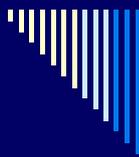
The Sebikotane success story Linking
Renewable Energy, and sustainable
development

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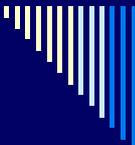
The case study related here is provided by an experience supported by ENDA (Syspro) in the peri urban Dakar metropole area about

- An original production system based on agro-forestry system, providing food (self sufficiency and exportation) and biomass (energy for cooking)
- A strategy of response to Climate Change as a local initiative of :
 - mitigation (carbon sequestration)
 - Adaptation to negative drought effects (reforestation)
- A strategy of social adaptation to intensive and fast population growth (in a context of urbanisation)
- A strategy of development of a modern economy (technical efficiency, financial profitability, environmental and social sustainability, respect of the PRSP - Poverty Reduction Strategy Programme)
- A strategy of private enterprise development and in come generation for poor communities and vulnarable socio-economic groups (youg people and women)
- A strategy of environment protection in a context of sahelian countries exposed to drought

1- Potential and constraints in a sahelian context of drought, demographic growth, economic crisis, urbanization and increasing basic needs (food, water, ...energy; etc.)

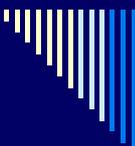
Senegal is a small country (200,000 km²) at the westernmost tip of mainland Africa





With a population of 10 millions people (2003), young and not enough educated

- A majority of the population (80%) is young (0-35 years)
- Most are not educated (70%), without professional training
- 51,1% living in rural areas and 48.9% in the cities
- most of the population depend on agriculture for living:
- During those last 15 years, the increasing tend of the demographic growth is higher than the tend of the economic growth (in the best cases, when economic growth is higher, the benefits are not shared with equity among socio economic groups and areas
- Providing livelihoods to this population is a big challenge (conditions of socio-economic progress : food security, education, health, access to water and energy), regarding physical constraints...
- Is...Achieving sustainable development reachable in this context ?



A quite good geographical situation

> A good location:

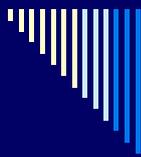
- between 12° and 17 ° northern latitude and 11° and 18° western longitude
- bordered by Atlantic Ocean (Senegal's coastal front along the Atlantic runs for 700kms)
- near from western Europe and America

> A favourable relief: a flat country with only 3 elevated relief

- the volcanic Cape Verde peninsula
- The Thiès "cliff"
- the foothills of the Fouta Djallon mountain range on the border with Guinea

> An acceptable hydraulic potential: with four rivers that meander through the country, having their sources in the Fouta Djallon foothills

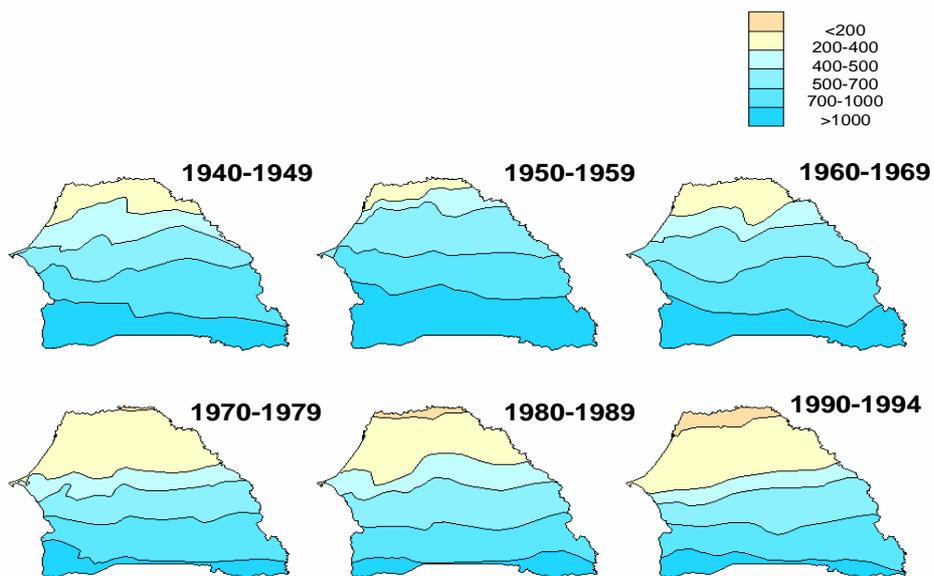
- the Senegal
- The Gambia,
- The Saloum
- and the Casamance



And, unfortunately, a dominant of sahelian climate

- the extreme case of an almost desertic climate in the north (annual rainfall does not exceed 350 mm)
- the continental Sahelian-Sudanese climate (annual rainfall ranges from 350mm to 700mm)
- The Sudanese climate (average rainfall of between 900 and 1,000 mm)
- The Sudanese-Guinean climate (with heavy rainfall of about 1,000mm to 1,200 mm)
- In terms of seasons that means:
 - A rainy season (from June to October), with the influence of a hot and humid monsoon and quite weak winds (2,9m/S, sept.)
 - A dry and windy season (from November to May), with the maritime trade winds and the Harmattan (an average of 5,3m/s, march)

Rainfall changes from 1940 to 1994 (mm/year)



*Source : Direction de la Météorologie Nationale – Senegal.

That produces a defavorable environmental context...

> A cycle of very dry years from the 70:

- From 1940 to 1994, Senegal endured 8 of its 10 driest ever years on record
- The first big drought hit the country in 1972,
- It has inaugurated a cycle of declining rainfall that struck further cruel blows (1976, 1979, 1982, 1983, 1984 (the record low), 1985 et 1986)

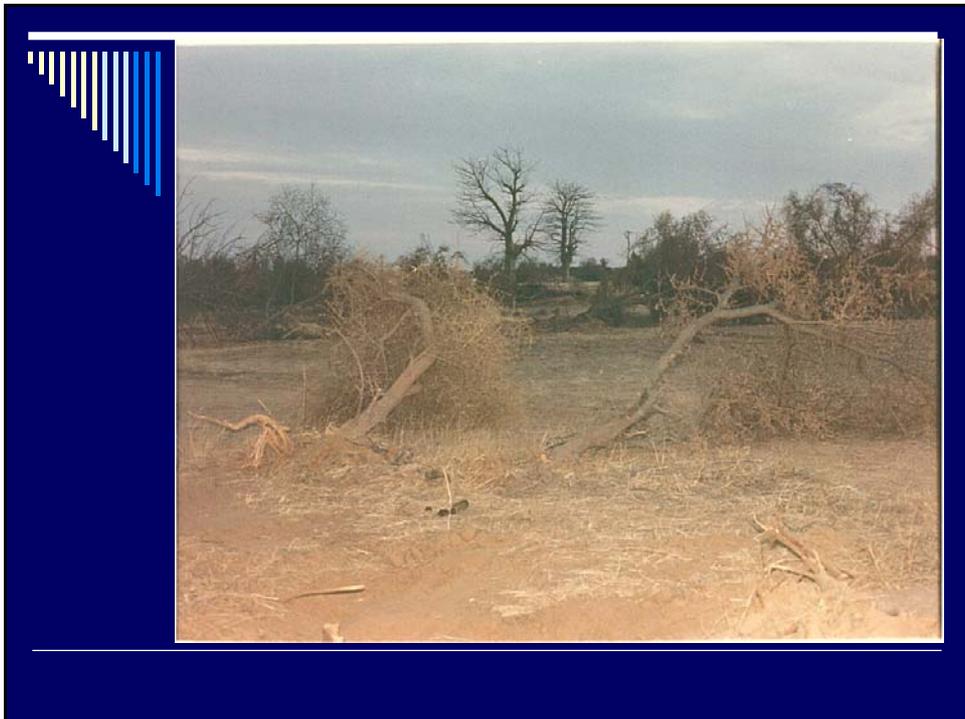
> With dramatic impact that :

- Affects water resources: because rainfall has dropped by 30-40% over the last three decades
- Reinforces the tend to environmental vulnerability with the main problem of the desertification (agriculture, energy for cooking),
- ...the zone became unfavourable to agriculture and was no longer able to provide natural resources to the poor communities around: the lost of natural vegetation (deforestation, desertification) had a negative effect on access to biomass energy on witch the population traditionally rely for domestic uses (cooking)

> How ?

- ▢ the lack of rain during the drought years caused massive loss of vegetation that left soil bare and exposed to brutal sea winds in the costal area
- ▢ Once good rainy seasons returned, soil is swept away (erosion, desertification)



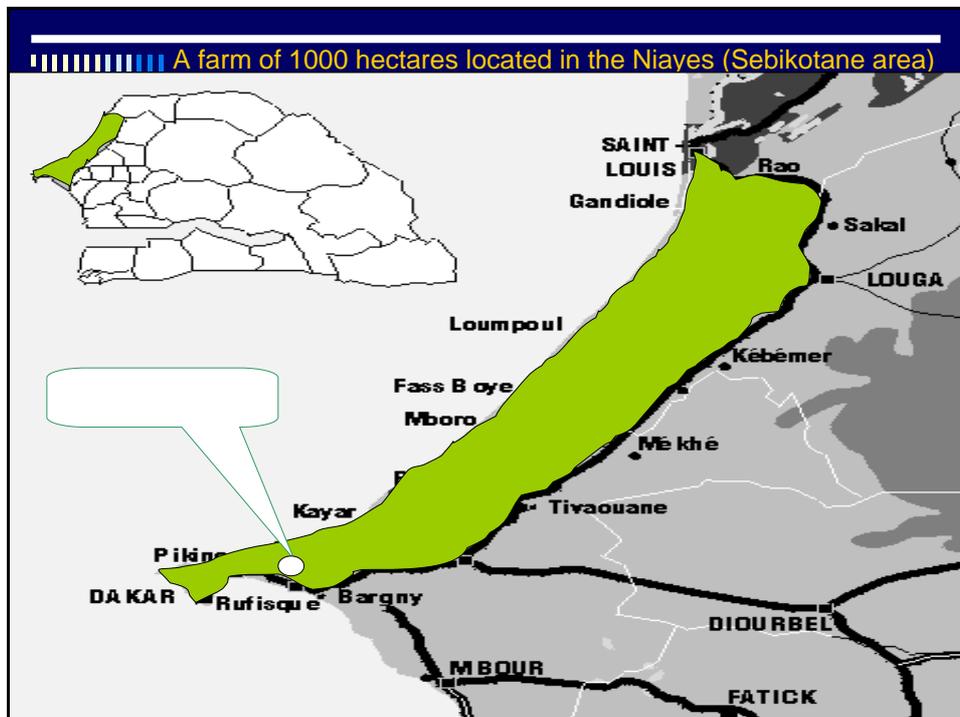


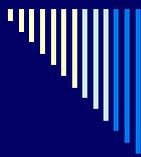


And a fragile socio-economical situation...

- migrations, from less favorable areas to those with a better natural resources potential (agriculture, fishing, energy, etc.)
- poverty in a large scale because Senegal as other Sahelian countries has a little rain fall... when 95% of the agricultural systems are dependent on rain
- with a mediocre national socio-economical situation (53,9% of households should be considered as poor in year 2001 when Senegal has been admitted in the LDC group)

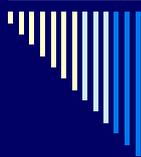
2- A project linking energy and sustainable development... in a national context where energy is not a priority taken account in the national Poverty Reduction Strategy Programme





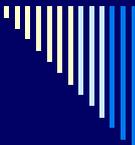
The potential of the area case study

- The Niayes region stretches along Senegal's northern sea board (180m long and 20km wide)
- The area presents good disposition for agriculture (climate, pedology and hydro-geology). It is suitable for agricultural and pastoral farming (horticulture, poultry and dairy farming)
- and is responsible for 80% of Senegal's market gardening output and fruit and vegetable exports
- Niayes is also close to major urban centres such as Dakar, Rufisque, Thiès, M'bour, Saint Louis and Louga
- Furthermore, the area is home to most of the country's dairy industry and almost all of its poultry farming
- The Sébikotane district which is the subject of our study represents a sizeable portion of the Niayes agricultural hub (25 000 inhabitants; fifty villages) where horticulture is at its most developed.



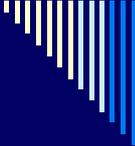
Consequences: an area of intensified population density and agriculture production

- After the droughts of the 1970s and 80s, there have been a massive migration from inland areas towards the coasts (Niayes is close to major urban centres such as Dakar, Rufisque, Thiès, M'bour, Saint Louis and Louga)
- Because its closeness to the sea,
- since there are ample ground water tables in the inter-dunal areas
- The Niayes area absorbed around half of these migrants, playing an important role in the Dakar area urbanisation (high-yield agriculture in smaller spaces, in a case of high population density and high pressure on the natural resources)
- There was an urgent need to pursue alternatives to the pluvial crops that hitherto made up 95% of rural production systems



The coincidence of the Sebikotane project and the aims of the programme Partners for Africa

- This is an example of adaptation to a combination of factors of those which produce a structural poverty :
 - natural resource management,
 - agricultural development,
 - Energy supply
 - carbon sequestration,
 - anti-desertification and
 - anti-poverty measures.
- It is undoubtedly a sound model for sustainable development that can be applied in similar situations elsewhere, mostly in poor sahelian countries



The concept of the Sebikotane project

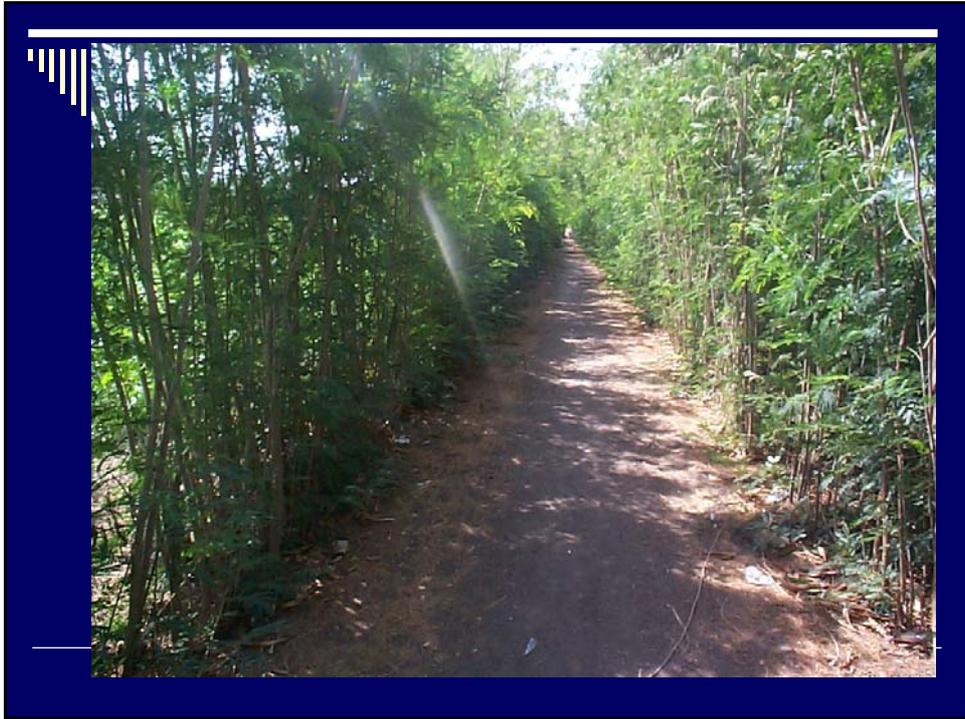
- Sébikotane's production system uses windbreaks requiring the production of some 19 tons of wood per hectare
- This system is:
 - mostly procured from planned cutting of the windbreaks every two years (to prevent them from competing with crops)
 - generates a surplus of wood that can then be used as cooking fuel (an aspect in contrast to traditional production systems, which use natural wood for cooking the food they produce)
 - is sustainable regarding the increasing needs of a growing urban population and the increasing lack of natural resources to satisfy some of those basic needs (water, biomass energy, etc.). This aspect of the project is essential: just 50 years ago, an ample supply of wood lay just 50 km from Dakar: now you would have to travel 600 km.
- the interest of the project regarding sustainable development, renewable energy supply, poverty reduction and gender approach that concern the programme Partners for Africa:
 - Annual food production in Senegal is around 2.5 million tons, while annual wood consumption stands at 3 million tons,
 - It takes 1.2 ton of wood to cook 1 ton of food produced.
 - It is slowly becoming impossible to fetch fuel-wood and charcoal (reserves are reaching exhaustion point)
 - It is also needed to factor in the consumption of imported food produce and other forms of cooking fuel such as gas. Poor people can not afford gas since the State do not longer subsidize this product as it did during more than 10 years (Structural economic reform effects)

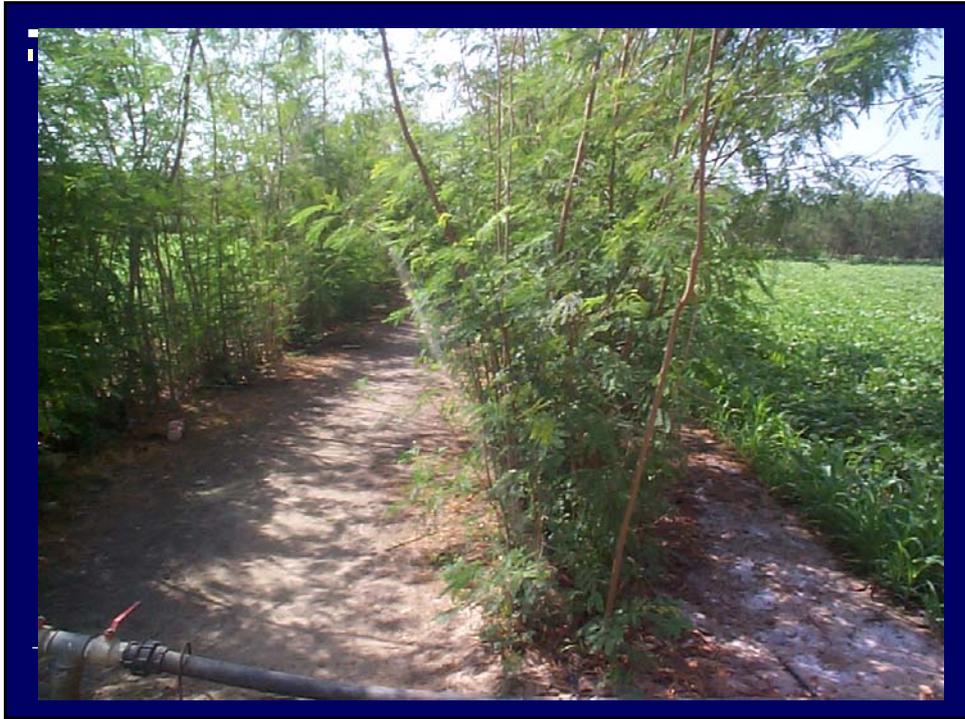
How does it work ?

- Sébikotane's agro-forestry system has been engineered by ENDA Syspro
- All the farms are irrigated, with particular emphasis being placed on drop irrigation, which is very economic with water and labour and had the added merit of fertilising while it irrigates
- The project is designed to stimulate and develop agriculture capable of fuelling social and economic development in Senegal
- it has been applied a new concept with :
 - an important role for agroforestry in order to support agriculture and biomass energy production. It means that in addition to the quickset hedges that lend the farm a distinct shape, the practice of contour cropping creates a micro-climate that offset wind and hydric erosion and stimulates production
 - The role of agro-forestry (trees as wind-breaks as biomass energy) is essential : mechanical protection from winds to plants + limitation of potential evapotranspiration + supporting organic matter in a way that enhances soil fertility+ production of traditional renewable energy
 - + a initiative promoting non fossil carbon sequestration

What is the solution of adaptation to Climate Change ?



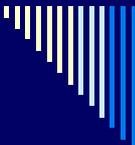






The main results

- At the beginning of the experience, considering technical and methodological difficulties, the measurement taken then concentrated solely on aerial biomass
- latter, in June 2003, ENDA Syspro carried out further measurements using mathematical models. These take account of both epigeal (*leucaena leucocephala*) and root part of the windbreaks
- This study shows that Sébikotane's agro forestry systems sequester on average 15 tons of carbon per hectare (root and aerial biomass) in five year old plots
- A further study assessed the quantity of carbon in the juice of the fruit of the cashew tree. This can be obtained by fermentation and measurement of the amount of ethanol mixed in with cellulose to produce gel fuel for cooking – this could replace charcoal, fuel wood and non-renewable natural gas. This saves thousands of hectares of woodland from clearing, since all that is required is the juice rather than the tree itself.



Analysis of the results

- Farmers achieve average yields of about 20 tons per hectare, and sometimes as much as 50 tons for speculative crops such as tomatoes
- This means that farmers' income is 20 times higher than when they used pluvial agriculture system. Average gross income per hectare can reach 3 million CFA francs (US\$6,000). What's more, when produce is packed and exported, extra added value and jobs are created (in packaging – by sea, road and air – processing and marketing).
- In spite of the clear ecological and economic benefits to this system, it would still be of great value to allocate a specific budget to encouraging farmers to adopt it in a large scale (national) – given that so many of them are so poor. To safeguard on-going funding, private businesses should seek private funds (from credit unions, etc.) while collective utilities must be back by the state
- Production systems combating desertification and sequestering just as much carbon as it produces food should be promoted, particularly as most production systems entail issuing emissions in order to consume the food produced
- Sequestering as much or more carbon than the amount food produced can help countries in the South (or at least the Sahel) to achieve enhanced synergy between fighting poverty and adapting to climate change.



A future national scaled project to link agriculture, renewable energy, mitigation, poverty reduction and sustainable development: "Senegal Agricole"

- "Sénégal Agricole" is a huge programme designed by SYSPRO
- It has to be implemented by the government of Senegal
- It aims to achieve food sovereignty for the country and boost economic growth by marketing produce
- It will be implemented across some 300,000 hectares in 33 sites in each of Senegal's 33 departments
- It will lead to the sequestration of some 4.5 million tons of carbon over a five year period, or 16.5 million equivalent tons of CO₂. This figure represents five times the net emission of Senegal in 1995
- If carbon is worth, say, 10 dollars per ton, these production systems could earn Senegalese farmers 45 million dollars, on top of the income from selling their produce (Indeed, for a certain period, USAID offered incentives of 40 francs for each tree planted in Niayes. Sébikotane farmers planted many for their windbreaks and quickly exhausted USAID's budget)

What are the results ?



Social aspects noticed and expected

- A new generation of Senegalese farmer sprouted in Sébikotane
- They are involved into horticulture (with the most demanding export markets possible) and wood production
- Men were the first, but ...
- women have quickly followed, becoming farm-owners and are forging a place for themselves in Senegal's economy, since they are an indispensable link in the production chain, covering everything from the provision of inputs to packaging and transportation of the production
- As men, they are generally organised into economic interest groups (EIG) or small or medium-sized businesses and are recognised as such by the state
- but they also continue to carry out the tasks traditionally assigned to women, such as sowing, weeding, harvesting, packing and processing, ...and fetching wood and water for the cooking
- So women are actors and main beneficiaries of the project, in terms of market production and domestic production: food sufficiency, in come generation, energy





Thank you for attention